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(54) Abstract Title
A commissioning module for a fluid distribution system

(57) A commissioning module 100 for a fluid distribution system comprises a plurality of fluid distribution valves 7, 8, 9, 10, isolating valves 2, 16, 18, fluid flow-regulating valves 25, 26, 27, 28, flow rate measuring means and at least one drain-off cock 6. The module 100 is operable to establish and to maintain set fluid-flow conditions in the fluid-distribution system. In operation the fluid distribution valves 7, 8, 9, 10 supply a working fluid to heat exchangers via supply lines 11, 12, 13, 14 and the working fluid returns from the heat exchangers by way of fluid exhaust lines 31, 32, 33, 34. The module 100 permits the filling and pressure testing of a fluid distribution system to which it belongs by use of a test point 15 for monitoring the fluid supply pressure and a test point 20 for monitoring the fluid exhaust pressure. The fluid flow rates throughout the fluid distribution system may be balanced in order to ensure that all parts of the system receive an adequate proportion of the total flow from a supply by the use of the regulating valves 25, 26, 27, 28. The module 100 may itself be flushed and cleaned by opening the isolating valve 16. In an alternative embodiment a commissioning module 100 includes a plurality of heat exchangers connected to the module 100.

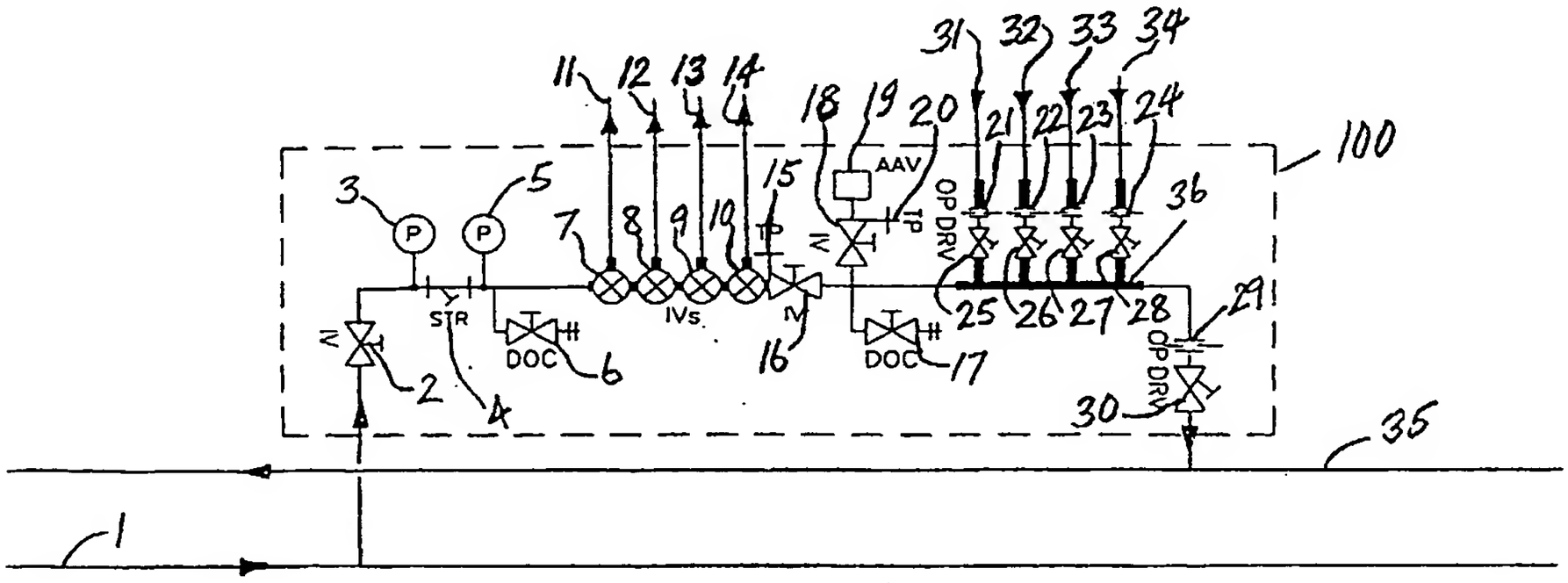

Fig 1

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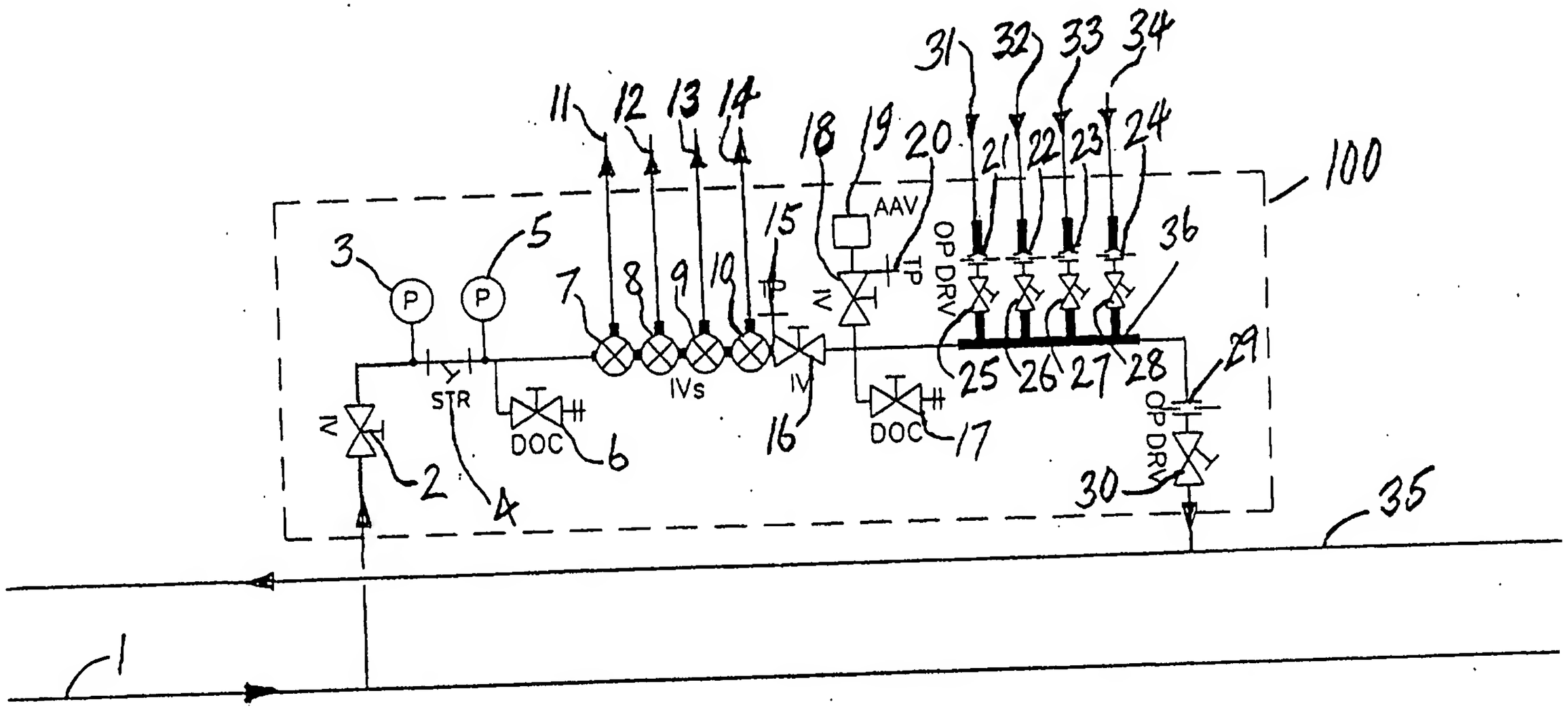

Fig 1

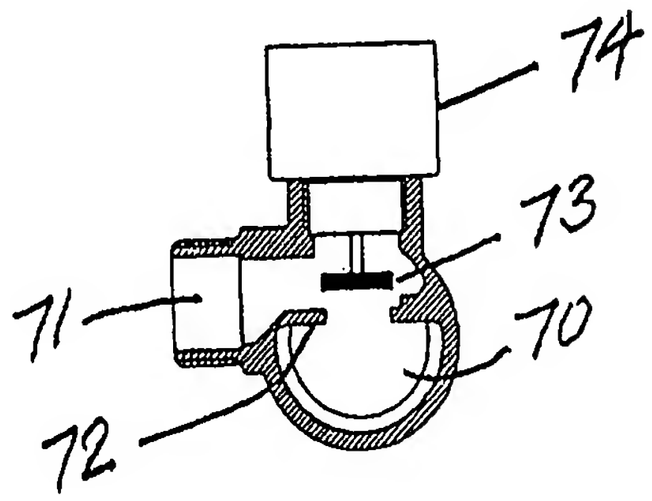

Fig 2

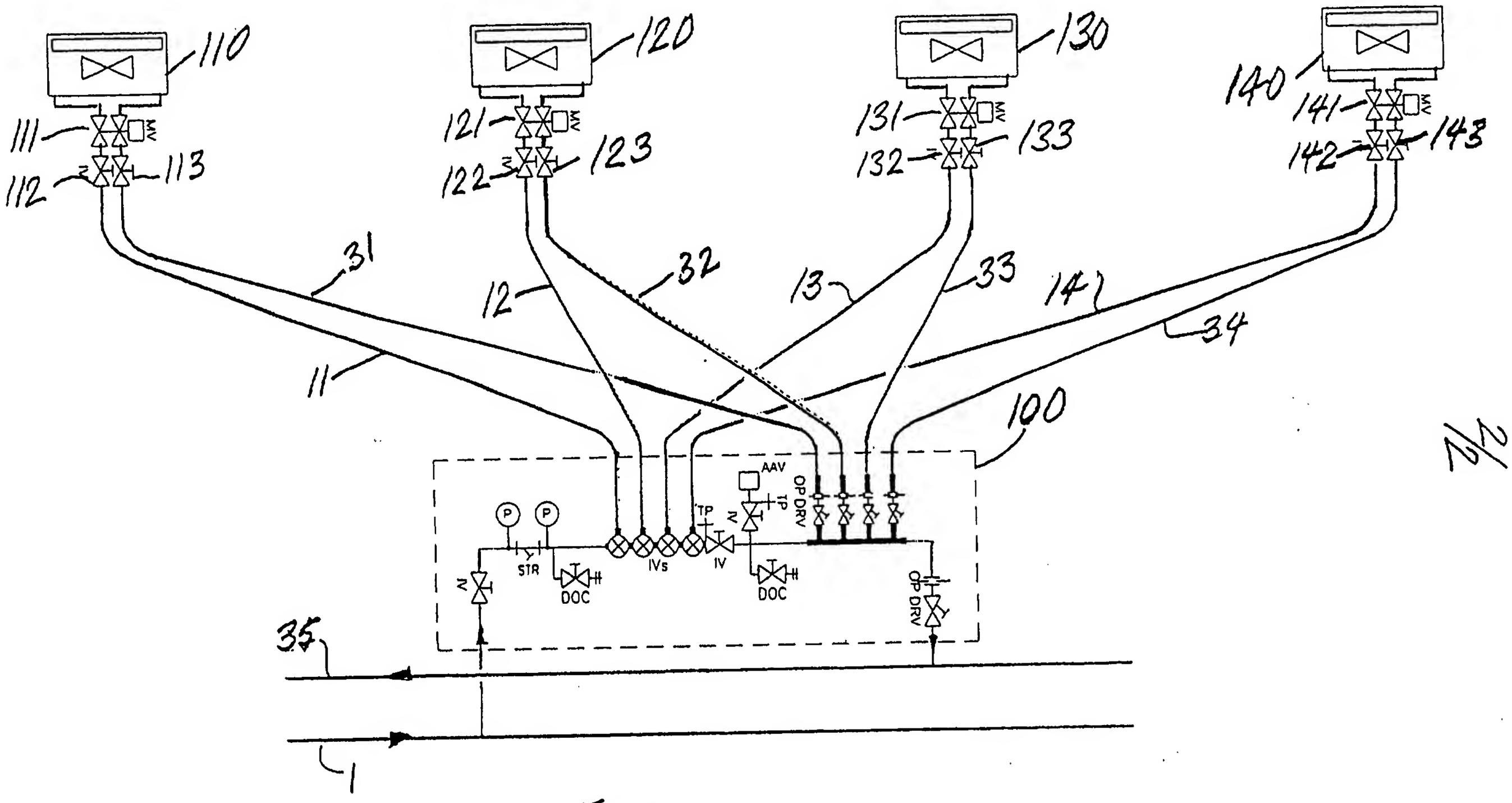

Fig 3

A commissioning module for a fluid-distribution system

The invention relates to a commissioning module for a fluid distribution system.

Fluid distribution systems include heating and cooling systems employing water as the working fluid and the commissioning of such systems involves testing the water integrity of the system, flushing and cleaning the system and, in addition, adjusting the flow rate of the working fluid in the various parts of the system.

The invention provides a commissioning module for a fluid-distribution system including:

a plurality of fluid distribution valves so connected together as to provide a first through-port communicating with a second through-port by way of a fluid passage, the fluid distribution valves including respective fluid outlet ports communicating with the fluid passage through fluid flow-control means,

a first isolating valve including an inlet port and an outlet port, the outlet port being connected to the first through port of the plurality of fluid distribution valves and the inlet port providing a fluid supply port of the commissioning module,

further isolating valve means including an inlet port and an outlet port, the inlet port being connected to the second through-port of the plurality of fluid-distribution valves and the outlet port being connected to a combined fluid-exhaust port of the commissioning module,

a plurality of fluid flow-regulating valves, the same in number as there are fluid-distribution valves, including respective inlet and outlet ports, the outlet ports being

connected to the combined fluid-exhaust port of the commissioning module,

a further fluid flow-regulating valve connected between the combined fluid-exhaust port and a further fluid exhaust port of the commissioning module,

flow-rate measuring means connected between the further fluid flow-regulating valve and the combined fluid-exhaust port of the commissioning module and

at least one drain-off cock connected to permit the draining of fluid from the commissioning module,

the commissioning module, in operation, providing supply fluid by way of its fluid supply port to the fluid outlet ports of the fluid distribution valves and removing exhaust fluid by way of the further fluid-regulating valve to its further fluid-exhaust port.

In one arrangement, the further isolating valve means is a second isolating valve including an inlet port and an outlet port, the inlet port being connected to the second through-port of the plurality of fluid-distribution valves and the outlet port being connected to a combined fluid-exhaust port of the commissioning module,

In an alternative arrangement, the further isolating valve means includes a first and a second additional isolating valve including respective inlet and outlet ports, the inlet port of the first additional isolating valve being connected to the second through-port of the plurality of fluid-distribution valves, the outlet port of the second additional isolating valve being connected to a combined fluid-exhaust port of the commissioning module and the inlet port of the second additional isolating valve being connected to the outlet port of the first additional isolating valve.

In the first arrangement, preferably, the commissioning module includes a drain-off cock connected to the combined fluid-exhaust port of the commissioning module.

In the alternative arrangement, preferably, the commissioning module includes a drain-off cock connected to the outlet port of the first additional isolating valve.

Preferably, in the first arrangement, the commissioning module includes a gas vent connected to its combined fluid-exhaust port.

Preferably, in the alternative arrangement, the commissioning module includes a gas vent connected through the further isolating valve means to its combined fluid exhaust port.

Preferably, the commissioning module includes a third isolating valve by way of which the gas vent is connected.

Preferably, the gas vent is an automatic gas vent.

Preferably, the commissioning module includes a drain-off cock connected to the first through-port of the plurality of fluid distribution valves.

Preferably, the commissioning module includes a filter member connected between the first isolating valve and the first through-port of the plurality of fluid-distribution valves.

Preferably, the commissioning module further includes respective additional flow-measuring means connected to the inlet ports of the plurality of fluid flow-regulating valves.

Preferably, the flow-rate measuring means include orifice plates.

Preferably, the commissioning module further includes at least one test point for monitoring a fluid condition in the commissioning module.

Preferably, the plurality of fluid-distribution valves are in the form of a first manifold.

Preferably, the plurality of flow-regulating valves are so connected together as to form a second manifold including a length of fluid conduit which serves as the combined fluid-exhaust port of the commissioning module and to which the outlet ports of the plurality of fluid flow-control valves are connected.

Preferably, the commissioning module is fabricated in a corrosion-resistant material.

A fluid-distribution system can include a commissioning module as claimed in accordance with the invention and, preferably, the fluid-distribution includes flexible plastics-coated aluminium fluid conduits connecting the commissioning module to a plurality of heat exchangers.

The invention provides, also, a fluid-distribution system including plurality of heat exchangers connected to a commissioning module, the commissioning module including:

a fluid supply port for receiving a working fluid for supply to the heat exchangers,

means providing a plurality of fluid-supply outlet ports connected to the inlet ports of the heat exchangers for supplying working fluid to the heat exchangers,

means providing a plurality of fluid-exhaust inlet ports connected to outlet ports of the heat exchangers for exhausting working fluid from the heat exchangers,

a combined fluid-exhaust port connected to exhaust working fluid from the fluid-exhaust inlet ports,

flow rate control means for adjusting the flow rate of the working fluid supplied to the heat exchangers,

flow-rate measuring means for measuring the flow rate of the working fluid supplied to the heat exchangers,

first flow-isolating means for opening and closing the fluid supply port of the commissioning module,

flow-bypass means for transferring fluid between the fluid supply port and the fluid-exhaust port, bypassing the heat exchangers and

fluid drain-off means for draining fluid from the commissioning module.

Preferably, the fluid-distribution system includes filter means connected to filter the working fluid passing through the commissioning module.

Preferably, the fluid-distribution system includes a gas vent connected to vent gas from the commissioning module and, preferably, the gas vent is an automatic gas vent.

Preferably, the fluid-distribution system includes a further flow-isolating means which is connected between the gas vent and the combined fluid- exhaust port of the commissioning module.

Preferably, the fluid-distribution system includes fluid flow-rate control means connected between the combined fluid-exhaust port and a further fluid exhaust port of the commissioning module.

Preferably, the flow-rate measuring means include orifice plates.

In one arrangement, preferably, the drain-off means includes a drain-off cock connected to the means providing the plurality of fluid-supply outlet ports.

In an alternative arrangement, preferably, the drain-off means includes a drain-off cock connected to the flow-bypass means of the commissioning module.

Preferably, the fluid-distribution system further includes at least one test point in the commissioning module for monitoring a fluid condition in the commissioning module.

Preferably, the means providing a plurality of fluid-supply outlet ports has the form of a first manifold.

Preferably, the means providing the plurality of fluid-exhaust inlet ports are so connected together as to form a second manifold including a length of fluid conduit which serves as the combined fluid-exhaust port of the commissioning module and to which the outlet ports of the means providing the plurality of fluid-exhaust inlet ports are connected.

Preferably, the commissioning module is fabricated in a corrosion-resistant material.

Preferably, the fluid-distribution system includes flexible plastics-coated aluminium fluid conduits connecting the commissioning module to the plurality of heat exchangers.

A commissioning module for a fluid-distribution system in accordance with the invention will now be described by way of example only with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic representation of a commissioning module in accordance with the invention,

Fig. 2 is a diagrammatic representation of a transverse cross-section through a fluid-distribution valve included in a flow manifold which forms a part of the commissioning module of Fig.1 and

Fig. 3 is a diagrammatic representation of a fluid-distribution system including the commissioning module of Fig. 1 as a control element.

With reference to Fig. 1 of the accompanying drawings, the commissioning module 100 includes a first isolating valve 2, a strainer 4, a first drain-off cock 6, first, second, third and fourth fluid-distribution valves 7, 8, 9, and 10, a second isolating valve 16, a second drain-off cock 17, a third isolating valve 18, an automatic air vent 19, first, second, third and fourth orifice plates 21, 22, 23 and 24, first, second, third and fourth double regulating valves 25, 26, 27 and 28, a fifth orifice plate 29 and a fifth double regulating valve 30. The commissioning module 100 further includes a first and second test points 3 and 5 between which lie the strainer 4, a third test point 15 which is adjacent to a port of the second isolating valve 16 and a fourth test point 20 which is adjacent to a port of the third isolating valve 18.

The first isolating valve 2 has a fluid-inlet and a fluid-outlet port, the fluid-inlet port of the first isolating valve providing a fluid-supply port for the commissioning module 100. The strainer 4 has a fluid-inlet port and a fluid-outlet port. The fluid-outlet port of the first isolating valve 2 is connected to the fluid-inlet port of the strainer 4.The fluid-outlet port of the strainer 4 is connected to a fluid-inlet port of a drain off cock 6 and the fluid-outlet port of the strainer 4 is also connected to the first fluid-distribution valve 7.

Fig. 2 of the accompanying drawings shows a transverse cross-section of one of the fluid-distribution valves, for example, the fluid-distribution valve 7. The fluid-distribution valve has a housing providing a fluid passage-

way 70 connecting together a first through-port and a second through-port, permitting the uninterrupted flow of fluid between the first and second through-ports by way of the fluid passage 70. The fluid-distribution valve includes an outlet port 71 which communicates with the fluid passage 70 by way of an aperture in a valve seat member 72. A movable valve member 73 is controlled by a screw control member 74 which, when rotated clockwise, moves the valve member 73 into engagement with the valve seat member 72, thereby isolating the fluid-outlet port 71 from the fluid passage 70. Connection between the outlet port 71 and the fluid passage 70 is effected by anti-clockwise rotation of the control member 74, thereby moving the movable valve member 73 away from the valve seat member 72.

The first, second, third and fourth fluid-distribution valves 7, 8, 9 and 10 are the same form of valve and the above description of the first fluid-distribution valve 7 is applicable to the second, third and fourth fluid-distribution valves 8, 9 and 10.

Referring to Fig. 1, the fluid-outlet port of the strainer 4 is connected to the first through-port of the first fluid-distribution valve 7. The second through-port of the first fluid-distribution valve 7 is connected to the first through-port of the second fluid-distribution valve 8, the second through-port of the second fluid-distribution valve 8 is connected to the first through-port of the third fluid-distribution valve 9 and the second through-port of the third fluid-distribution valve 9 is connected to the first through-port of the fourth fluid-distribution valve 10. The output ports of the first, second, third and fourth fluid-distribution valves 7, 8, 9 and 10 are shown connected to supply fluid lines 11, 12, 13 and 14,

respectively, belonging to a fluid-distribution system which may include the commissioning module.

The second through-port of the fourth fluid-distribution valve 10 is connected to the inlet port of the second isolating valve 16. The outlet port of the second isolating valve 16 is connected to the inlet port of a third isolating valve 18 and to the second drain-off cock 17. The outlet port of the third isolating valve 18 is connected to an automatic air vent 19.

The second isolating valve 16, which is usually shut, serves to separate the fluid-supply part of a fluid-distribution system, which includes the commissioning module, from the fluid-exhaust part of the fluid-distribution system. When the second isolating valve 16 is open it serves as a bypass route between the fluid-supply and fluid-exhaust parts of the system. Consequently, the second drain-off cock 17, the third isolating valve 18 and the automatic air vent serve as components of the fluid-exhaust part of the fluid-distribution system.

A fluid-exhaust line 31 of a fluid-distribution system which includes the commissioning module is connected to the inlet port of the first orifice plate 21 which has an inlet port and an outlet port. The outlet port of the orifice plate is connected to the inlet port of the first double regulating valve 25 and the outlet port of the double regulating valve 25 is connected to the outlet port of the second isolating valve 16.

Further fluid-exhaust lines 32, 33 and 34 of the fluid-distribution system are connected to the respective inlet ports of the second, third and fourth orifice plates 22, 23 and 24. The outlet ports of the orifice plates are connected to the inlet ports of the double regulating

valves 26, 27 and 28, respectively, and the outlet ports of the double regulating valves 26, 27 and 28 are connected to the outlet port of the second isolating valve 16 by means of a length of conduit 36 serving as a combined fluid-exhaust port. The outlet ports of the double regulating valves 25, 26, 27 and 28 are connected also to the inlet port of the fifth orifice plate 29. The outlet port of the fifth orifice plate 29 is connected to the inlet port of the fifth double regulating valve 30 and the outlet port of the fifth double regulating valve 30 provides a further fluid-exhaust port of the commissioning module 100.

Alternative arrangements include the positioning of the second drain-off cock 17, the third isolating valve 18 and the automatic air vent 19 adjacent to the fourth double regulating valve 28 rather than as shown in Fig. 1 where the second drain-off cock 17, the third isolating valve 18 and the automatic air vent 19 are positioned adjacent to the first double regulating valve 25.

As is shown in Fig. 1, the fluid-distribution valves 7, 8, 9 and 10 are so grouped together as to form a fluid supply-manifold, the first through-port of the first fluid distribution valve 7 and the second through-port of the fourth fluid-distribution valve 10 providing through-ports of the fluid supply-manifold, there being a through-passage between those through-ports of the manifold.

Also as shown in Fig. 1, the first, second, third and fourth orifice plates 21, 22, 23 and 24 with the first, second, third and fourth double regulating valves 25, 26, 27 and 28 are so grouped together with appropriate connection components, including the length of fluid conduit 36, as to form a fluid exhaust-manifold.

The commissioning module 100 functions as follows:

The fluid-distribution valves 7, 8, 9 and 10 supply a working fluid to respective heat exchangers by way of fluid supply lines 11, 12, 13 and 14 and the working fluid returns from the heat exchangers by way of fluid exhaust lines 31, 32, 33 and 34. The exhaust flow of the working fluid passes through the orifice plates 21, 22, 23 and 24 to the double regulating valves 25, 26, 27 and 28 to the fifth orifice plate 29 and to the fifth double regulating valve 30. The fifth orifice plate 25 is used to measure the overall flow rate for the commissioning module (the pressure drop across an orifice plate is an indication of flow rate) and the orifice plates 21, 22, 23 and 24 are selected to measure the flow rates for the respective fluid supply-exhaust lines 11-31, 12-32, 13-33 and 14-34. The fifth double regulating valve 30 effects adjustment of the overall flow rate and the double regulating valves 25, 26, 27 and 28 effect the adjustment of the individual flow rates for the respective fluid supply-exhaust lines 11-31, 12-32, 13-33 and 14-34. The automatic air vent 19 operates to vent air from the system when the third isolating valve 18 is open. The strainer 4 serves as a filter and removes particulate material from the working fluid. The test points 3 and 5 permit the monitoring of the pressure drop across the strainer 4, a rise in the pressure drop indicating the need to remove and clean the strainer 4. Closure of the first isolating valve 2 effects the shut-off of supply fluid for removal of the strainer 4 or for any other reason requiring the shut-off of supply fluid. The first and second drain-off cocks 6 and 17 permit the system to be drained of fluid when the first isolating valve 2 is shut.

The commissioning module 100 permits the filling and pressure testing of a fluid distribution system to which it belongs by use of the test point 15 for monitoring the fluid supply pressure and the test point 20 for monitoring the fluid exhaust pressure. The fluid flow rates throughout the fluid distribution system are balanced in order to ensure that all parts of the system receive an adequate proportion of the total flow from the supply by the use of the double regulating valves 25, 26, 27 and 28. The commissioning module itself is flushed and cleaned by opening the second isolating valve 16, the strainer 4 effecting the removal of dirt, and the system as a whole is flushed and cleaned by closure of the second isolating valve 16.

Specific benefits attributed to the commissioning module include:

The provision of the single strainer 4, the single bypass valve 16 and drain-off cocks 6 and 17 capable of serving a fluid-distribution system including several heat exchangers.

The strainer 4 may be omitted and flow-rate measurement devices other than orifice plates may be used. Also, any form of fluid-regulating valve could be used rather than double regulating valves. Although referred to as an air vent, the vent 19 would, of course, vent any gas in the fluid-distribution system.

The provision of the air vent 19 at a position permitting the venting of several heat exchangers.

The access points are few in number and commissioning of the fluid-distribution system, being executed principally from the commissioning module, is effected with

reduced need for access to other parts of the system and, consequently, reduced disturbance to adjacent structures.

The working fluid is most usually water which is heated for a heating system and cooled for a cooling system, the heat exchangers being selected as appropriate according to whether heating or cooling is required.

Reference is made to Fig. 3 of the accompanying drawings showing a fluid-distribution system including the commissioning module 100 and fluid supply-exhaust lines 11-31 and including, further, a first heat exchanger 110 connected to the fluid supply-exhaust line 11-31 by way of a first motorised valve 111 and fourth and fifth isolating valves 112 and 113.

Fig. 3 shows, further, second, third and fourth heat exchangers 120, 130 and 140 connected to the fluid supply-exhaust lines 12-32, 13-33 and 14-34 by way of respective motorised valves 121, 131 and 141 and isolating valves 122, 123, 132, 133, 142 and 143.

The commissioning of the fluid-distribution system is effected by means of the commissioning module 100 principally by the use of the components of the commissioning module 100, as described above, the commissioning module 100 remaining connected into the fluid-distribution system and serving as a component of the system.

The motorised valves 111, 121, 131 and 141 serve to control the fluid flow through the heat exchangers 110, 120, 130 and 140 as instructed by a controller (not shown) and the isolating valves 112, 113, 122, 123, 132, 133, 142 and 143 serve as conventional isolation valves.

The fluid-distribution system may be a heating or a cooling system and the working fluid may be water.

The commissioning module 100 shown in Figs. 1 and 3 is capable of operation in a fluid-distribution system including up to 4 heat exchangers and it will be appreciated that more heat exchangers could be accommodated by increasing the number of fluid-distribution valves and the number of orifice plate-double regulating valve pairs as necessary.

The fluid supply-exhaust lines 11-31, 12-32, 13-33 and 14-34 are flexible plastics-coated aluminium pipes which are installable more quickly than rigid pipes which are usually copper. The components of the commissioning module 100 are made of a corrosion-resistant material.

The commissioning module shown in Fig. 1 may be modified to include a further isolating valve between the length of fluid conduit 36 and the isolating valve 16, the drain-off cock 17 then being connected to the junction between the isolating valve 16 and the further isolating valve. The drain-off cock 6 may be omitted when the further isolating valve referred to is present.

CLAIMS

1. A commissioning module for a fluid-distribution system including:

a plurality of fluid distribution valves so connected together as to provide a first through-port communicating with a second through-port by way of a fluid passage, the fluid distribution valves including respective fluid outlet ports communicating with the fluid passage through fluid flow-control means,

a first isolating valve including an inlet port and an outlet port, the outlet port being connected to the first through port of the plurality of fluid distribution valves and the inlet port providing a fluid supply port of the commissioning module,

further isolating valve means including an inlet port and an outlet port, the inlet port being connected to the second through-port of the plurality of fluid-distribution valves and the outlet port being connected to a combined fluid-exhaust port of the commissioning module,

a plurality of fluid flow-regulating valves, the same in number as there are fluid-distribution valves, including respective inlet and outlet ports, the outlet ports being connected to the combined fluid-exhaust port of the commissioning module,

a further fluid flow-regulating valve connected between the combined fluid-exhaust port and a further fluid exhaust port of the commissioning module,

flow-rate measuring means connected between the further fluid flow-regulating valve and the combined fluid-exhaust port of the commissioning module and

at least one drain-off cock connected to permit the draining of fluid from the commissioning module,

the commissioning module, in operation, providing supply fluid by way of its fluid supply port to the fluid outlet ports of the fluid distribution valves and removing exhaust fluid by way of the further fluid-regulating valve to its further fluid-exhaust port.

2. A commissioning module as claimed in claim 1, wherein the further isolating valve means is a second isolating valve including an inlet port and an outlet port, the inlet port being connected to the second through-port of the plurality of fluid-distribution valves and the outlet port being connected to a combined fluid-exhaust port of the commissioning module,

3. A commissioning module as claimed in claim 1, wherein the further isolating valve means includes a first and a second additional isolating valve including respective inlet and outlet ports, the inlet port of the first additional isolating valve being connected to the second through-port of the plurality of fluid-distribution valves, the outlet port of the second additional isolating valve being connected to a combined fluid-exhaust port of the commissioning module and the inlet port of the second additional isolating valve being connected to the outlet port of the first additional isolating valve.

4. A commissioning module as claimed in claims 1 or claim 2, including a drain-off cock connected to the combined fluid-exhaust port of the commissioning module.

5. A commissioning module as claimed in claim 3, including a drain-off cock connected to the outlet port of the first additional isolating valve.

6. A commissioning module as claimed in claim 1 or claim 2 or claim 4, including a gas vent connected to its combined fluid-exhaust port.

7. A commissioning module as claimed in claim 1 or claim 3 or claim 5, including a gas vent connected through the further isolating valve means to its combined fluid exhaust port.

8. A commissioning module as claimed in claims 6 or claim 7, including a third isolating valve by way of which the gas vent is connected.

9. A commissioning module as claimed in any one of claims 6 to 8, wherein the gas vent is an automatic gas vent.

10. A commissioning module as claimed in any one of claims 1 to 9, including a drain-off cock connected to the first through-port of the plurality of fluid distribution valves.

11. A commissioning module as claimed in any one of claims 1 to 10, including a filter member connected between the first isolating valve and the first through-port of the plurality of fluid-distribution valves.

12. A commissioning module as claimed in any one of claims 1 to 11, further including respective additional flow-

measuring means connected to the inlet ports of the plurality of fluid flow-regulating valves.

13. A commissioning module as claimed in any one of claims 1 to 12, wherein the flow-rate measuring means include orifice plates.

14. A commissioning module as claimed in any one of claims 1 to 13, further including at least one test point for monitoring a fluid condition in the commissioning module.

15. A commissioning module as claimed in any one of claims 1 to 14, wherein the plurality of fluid-distribution valves are in the form of a first manifold.

16. A commissioning module as claimed in any one of claims 1 to 15, wherein the plurality of flow-regulating valves are so connected together as to form a second manifold including a length of fluid conduit which serves as the combined fluid-exhaust port of the commissioning module and to which the outlet ports of the plurality of fluid flow-control valves are connected.

17. A commissioning module as claimed in any one of claims 1 to 16, fabricated in a corrosion-resistant material.

18. A commissioning module substantially as herein described with reference to and as shown in Fig. 1 or Figs. 1 and 2 of the accompanying drawings.

19. A fluid-distribution system including a commissioning module as claimed in any one of claims 1 to 18.

20. A fluid-distribution system as claimed in claim 19, including flexible plastics-coated aluminium fluid conduits connecting the commissioning module to a plurality of heat exchangers.

21. A fluid-distribution system including plurality of heat exchangers connected to a commissioning module, the commissioning module including:

a fluid supply port for receiving a working fluid for supply to the heat exchangers,

means providing a plurality of fluid-supply outlet ports connected to the inlet ports of the heat exchangers for supplying working fluid to the heat exchangers,

means providing a plurality of fluid-exhaust inlet ports connected to outlet ports of the heat exchangers for exhausting working fluid from the heat exchangers,

a combined fluid-exhaust port connected to exhaust working fluid from the fluid-exhaust inlet ports,

flow rate control means for adjusting the flow rate of the working fluid supplied to the heat exchangers,

flow-rate measuring means for measuring the flow rate of the working fluid supplied to the heat exchangers,

first flow-isolating means for opening and closing the fluid supply port of the commissioning module,

flow-bypass means for transferring fluid between the fluid supply port and the fluid-exhaust port, bypassing the heat exchangers and

fluid drain-off means for draining fluid from the commissioning module.

22. A fluid-distribution system as claimed in claim 21, including filter means connected to filter the working fluid passing through the commissioning module.

23. A fluid-distribution system as claimed in claim 21 or claim 22, including a gas vent connected to vent gas from the commissioning module.

24. A fluid-distribution system as claimed in claim 23, wherein the gas vent is an automatic gas vent.

25. A fluid-distribution system as claimed in claim 23 or claim 24, including a further flow-isolating means which is connected between the gas vent and the combined fluid-exhaust port of the commissioning module.

26. A fluid-distribution system as claimed in any one of claims 21 to 25, including fluid flow-rate control means connected between the combined fluid-exhaust port and a further fluid exhaust port of the commissioning module.

27 A fluid-distribution system as claimed in any one of claims 21 to 26, wherein the flow-rate measuring means include orifice plates.

28. A fluid-distribution system as claimed in any one of claims 21 to 27, wherein the drain-off means includes a drain-off cock connected to the means providing the plurality of fluid-supply outlet ports.

29. A fluid-distribution system as claimed in any one of claims 21 to 28, wherein the drain-off means includes a

drain-off cock connected to the flow-bypass means of the commissioning module.

30. A fluid-distribution system as claimed in any one of claims 21 to 29, further including at least one test point in the commissioning module for monitoring a fluid condition in the commissioning module.

31. A fluid-distribution system as claimed in any one of claims 21 to 30, wherein the means providing a plurality of fluid-supply outlet ports has the form of a first manifold.

32. A fluid-distribution system as claimed in any one of claims 21 to 31, wherein the means providing the plurality of fluid-exhaust inlet ports are so connected together as to form a second manifold including a length of fluid conduit which serves as the combined fluid-exhaust port of the commissioning module and to which the outlet ports of the means providing the plurality of fluid-exhaust inlet ports are connected.

33. A fluid-distribution system as claimed in any one of claims 21 to 32, wherein the commissioning module is fabricated in a corrosion-resistant material.

34. A fluid-distribution system as claimed in any one of claims 21 to 33, including flexible plastics-coated aluminium fluid conduits connecting the commissioning module to the plurality of heat exchangers.

35. A fluid-distribution system substantially as herein described with reference to and as shown in Fig. 3 of the accompanying drawings.

INVESTOR IN PEOPLE

Application No: GB 0113234.9 **Examiner:** Kalim Yasseen
Claims searched: 1-35 **Date of search:** 29 November 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): F4U (UC, U23, U29)

Int Cl (Ed.7): F16K (11/00); F24D(19/08)

Other: Online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 6 026 843 A (POZNIAK) valve box manifold system and distribution, method	
A	US 3 134 395 A (GLASGOW) manifold valve	
A	Online (WPI) abstract for DE3419498 A (KLAUS), a flow distributor	
A	Online (WPI) abstract for FR2579289 A (MASTROMATTEO), a fluid dispenser module	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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